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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/961,134	09/21/2001	Stan Tsai	5262/CMP/CMP/RKK	4110
32588	7590	02/06/2004	EXAMINER	
APPLIED MATERIALS, INC.			WONG, EDNA	
2881 SCOTT BLVD. M/S 2061			ART UNIT	PAPER NUMBER
SANTA CLARA, CA 95050			1753	

DATE MAILED: 02/06/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/961,134

Applicant(s)

TSAI ET AL.

Examiner

Edna Wong

Art Unit

1753

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 29 December 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-25 is/are pending in the application.
- 4a) Of the above claim(s) 11-23 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10, 24 and 25 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

This is in response to the Amendment dated December 29, 2003. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

### ***Response to Arguments***

#### Specification

The disclosure has been objected to because of minor informalities.

The objection to the disclosure has been withdrawn in view of Applicants' amendment.

#### Claim Rejections - 35 USC § 112

Claim 4 has been rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The rejection of claim 4 under 35 U.S.C. 112, second paragraph, has been withdrawn in view of Applicants' amendment.

#### Claim Rejections - 35 USC § 102

Claims 1-3, 5-6 and 8 have been rejected under 35 U.S.C. 102(b) as being anticipated by **Ashjaee et al.** (US Patent Application Publication No. 2003/0029731 A1).

The rejection of claims 1-3, 5-6 and 8 under 35 U.S.C. 102(b) as being

anticipated by Ashjaee et al. has been withdrawn in view of Applicants' amendment.

Claim Rejections - 35 USC § 103

Claims **4 and 7** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Ashjaee et al.** (US Patent Application Publication No. 2003/0029731 A1) as applied to claims 1-3, 5-6 and 8 above.

The rejection of claims 4 and 7 under 35 U.S.C. 103(a) as being unpatentable over Ashjaee et al. as applied to claims 1-3, 5-6 and 8 above has been withdrawn in view of Applicants' amendment.

***Response to Amendment***

***Election/Restrictions***

Newly submitted claims **11-23** are directed to an invention that is independent or distinct from the invention originally claimed for the following reasons:

New method claims 11 and 12 are not directed to the originally presented method which was "A method of forming a metal layer on a substrate, comprising: providing a substrate to an electroplating cell, wherein the electroplating cell has a porous pad and an electrolyte solution therein; contacting portions of the substrate to the porous pad; and forming a metal layer onto the substrate, wherein the metal layer is formed on the substrate by alternately applying a first electrical potential and a second electrical potential to the electrolyte solution, and wherein the first electrical potential

deposits metal on the substrate while the second electrical potential removes metal from the contacted portions of the substrate.

Apparatus claims 13-23 are not directed to the invention originally claimed. The invention originally claimed was a method.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims **11-23** are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

### ***Claim Objections***

Claims **8 and 24** are objected to because of the following informalities:

#### **Claim 8**

line 2, the word "are" should be amended to the word -- is --.

#### **Claim 24**

line 2, the word "to" should be amended to the word -- in --.

Appropriate correction is required.

***Claim Rejections - 35 USC § 112***

I. Claims **1-10 and 25** are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claim 1

lines 10-11, "then biasing the substrate relative to a second electrode at a second electrical bias".

Claim 10

lines 6-7, "then biasing the substrate relative to a second electrode at a second electrical bias".

Claim 25

lines 6-7, "concurrently biasing the substrate relative to a second electrode at a second electrical bias".

The specification does not disclose these claim limitations.

II. Claims **6-9 and 24** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter

which applicant regards as the invention.

Claim 6

line 1, "the first electrical potential" lacks antecedent basis.

line 2, "the second electrical potential" lacks antecedent basis.

Claim 7

lines 1-2, "the first electrical potential" lacks antecedent basis.

line 2, "the second electrical potential" lacks antecedent basis.

Claim 8

lines 1-2, "the first electrical potential" lacks antecedent basis.

line 2, "the second electrical potential" lacks antecedent basis.

Claim 9

line 1, "the first electrical potential" lacks antecedent basis.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that

form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

- I. Claims **1-3** are rejected under 35 U.S.C. 102(e) as being anticipated by **Talieh et al.** (US Patent No. 6,328,872 B1).

Talieh teaches a method of forming a metal layer on a substrate, comprising the steps of:

(a) positioning a substrate **2** in an electroplating cell **100**, wherein the electroplating cell has a porous pad **16** (col. 5, lines 32-42) and an electrolyte solution **11** therein;

(b) contacting at least a portions of the substrate to the porous pad (col. 5, lines 1-25); and

(c) forming a metal layer onto the substrate by biasing the substrate relative to an electrode **20** at a first electrical bias and then biasing the substrate relative to a second electrode **22** at a second electrical bias wherein the first electrical bias deposits metal on the substrate (= plating) while the second electrical bias removes metal from the contacted portions of the substrate (= polishing) [col. 4, lines 52-67; and Figs. 2 and 3].

The substrate and the porous pad move **28, 30** relative to one another during metal layer formation (col. 4, lines 5-12; and Figs. 2 and 3).



The metal layer comprises copper (Cu) [col. 3, lines 62-65].

II. Claim **25** is rejected under 35 U.S.C. 102(e) as being anticipated by **Talieh et al.** (US Patent No. 6,328,872 B1).

Talieh teaches a method of forming a metal layer on a substrate, comprising the steps of:

(a) positioning a substrate **2** in an electroplating cell **100** having a porous pad **16** and an electrolyte solution **11** therein;

(b) contacting at least a portion of the substrate to the porous pad (col. 5, lines 1-25); and

(c) forming a metal layer on the substrate by biasing the substrate relative to an electrode **20** at a first electrical bias and concurrently biasing the substrate relative to a second electrode **22** at a second electrical bias, wherein the first electrical bias deposits metal on the substrate (= plating) and the second electrical bias removes metal from the substrate (= polishing) [col. 4, lines 52-67; and Figs. 2 and 3].

### ***Claim Rejections - 35 USC § 103***

I. Claims **4-9** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Talieh et al.** (US Patent No. 6,328,872 B1) as applied to claims 1-3 above.

Talieh is as applied above and incorporated herein.

Talieh does not teach wherein the porous pad contacts portions of the substrate with a pressure in a range of about 0.1 psi and about 5 psi.

However, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Talieh with wherein the porous pad contacts portions of the substrate with a pressure in a range of about 0.1 psi and about 5 psi because a pressure between the porous pad **16** and the substrate **2** inherently exists in the method of Talieh. Although not disclosed by Talieh, the pressure is a result-effective variable and one skilled in the art has the skill to calculate the pressure that would determine the success of the desired reaction to occur, i.e., plating or polishing, absent evidence to the contrary. MPEP § 2141.03 and § 2144.05(b).

As to wherein the electrolyte solution comprises one or more materials selected from the group of water, pH adjusting agents, and metallic species, Talieh teaches plating copper into vias, trenches, and/or other desired areas of a wafer using an electrolyte solution **11** (col. 3, lines 60-65; and Figs. 2 and 3). Aqueous, acidic copper electrolyte solutions are conventional in the semiconductor plating art, and thus, water (= aqueous), pH adjusting agents (= acidic), and metallic species (= copper) would have been conventional components in the solutions.

As to wherein the first electrical potential has an opposite polarity from that of the second electrical potential, this is well within the skill of one having ordinary skill in the art because Talieh teaches that as is known in the art, the difference in the amount of electric potential applied to each of the two cylindrical anodes **20, 22** determines which anode assembly is used for plating and which one is used for electropolishing (col. 4, lines 60-67). In the art, the cathodic potential would have electroplated the conductive material onto the substrate and the anodic potential would have removed the conductive material from the substrate.

As to wherein either of the first electrical potential and the second electrical potential are alternately applied to the substrate relative to the first electrode or the second electrode with a range of about -5 volts to about 5 volts, Talieh teaches that the wafer **2** is moved side to side so that the center area of the wafer is plated and polished (col. 4, lines 5-19). As shown in Fig. 2, the wafer **2** is either polished when moved to the left side or plated when moved to the right side. It is well within the skill of one having ordinary skill in the art to alternately applied the first electrical potential and the second electrical potential to the substrate relative to the first electrode or the second electrode because polishing and plating are not done at the same time on the wafer **2**.

As to a range of about -5 volts to about 5 volts, a voltage inherently exists in the method of Talieh. Although not disclosed by Talieh, the voltage is a result-effective variable and one skilled in the art has the skill to calculate the voltage that would

determine the success of the desired reaction to occur, i.e., plating or polishing, absent evidence to the contrary. MPEP § 2141.03 and § 2144.05(b).

As to wherein either of the first electrical potential and the second electrical potential is alternately applied to the first electrode or the second electrode for differing time periods, Talieh teaches that the wafer 2 is moved side to side so that the center area of the wafer is plated and polished (col. 4, lines 5-19). As shown in Fig. 2, the wafer 2 is either polished when moved to the left side or plated when moved to the right side. It is well within the skill of one having ordinary skill in the art to alternately applied the first electrical potential and the second electrical potential for differing time periods because polishing and plating are not done at the same time on the wafer 2.

As to wherein the first electrical potential applied relative to the first electrode is within a range of about 0 volts to about +5 volts and the second electrical potential applied relative to the second electrode is within a range of about 0 volts to about -5 volts are alternately applied, this is well within the skill of one having ordinary skill in the art because a voltage inherently exists in the method of Talieh. Although not disclosed by Talieh, the voltage is a result-effective variable and one skilled in the art has the skill to calculate the voltage that would determine the success of the desired reaction to occur, i.e., plating or polishing, absent evidence to the contrary. MPEP § 2141.03 and § 2144.05(b).

II. Claim **10** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Talieh et al.** (US Patent No. 6,328,872 B1).

Talieh teaches a method of forming a metal layer on a substrate, comprising the steps of:

(a) positioning a substrate **2** in an electroplating cell having a porous pad **16** and an electrolyte solution **11** therein;

(b) contacting at least a portion of the substrate to the porous pad (col. 5, lines 1-25); and

(c) forming a metal layer on the substrate by biasing the substrate relative to an electrode **20** at a first electrical bias and then biasing the substrate relative to a second electrode **22** at a second electrical bias, wherein the first electrical bias deposits metal on the substrate (= plating) and the second electrical bias removes metal from the substrate (polishing) [col. 4, lines 52-67; and Figs. 2 and 3]; and

Talieh does not teach varying the magnitude of the second electrical bias relative to the first electrical bias as the metal layer is formed.

However, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Talieh by varying the magnitude of the second electrical bias relative to the first electrical bias as the metal layer is formed because Talieh teaches that as is known in

the art, the difference in the amount of electric potential applied to each of the two cylindrical anodes **20, 22** determines which anode assembly is used for plating and which one is used for electropolishing (col. 4, lines 60-67). Thus, the magnitude of the second electrical bias relative to the first electrical bias would have been varied based on the difference in the amount of electric potential applied to each of the two cylindrical anodes **20, 22** which determines which anode assembly is used for plating and which one is used for electropolishing, and on the changes in resistance for the deposition of the conductive material and for the removal of the conductive material.

Furthermore, the magnitude of the second electrical bias relative to the first electrical bias is a result-effective variable and one skilled in the art has the skill to calculate the magnitude that would determine the success of the desired reaction to occur, i.e., plating or polishing, absent evidence to the contrary. MPEP § 2141.03 and § 2144.05(b).

**III.** Claim **24** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Ashjaee et al.** (US Patent Application Publication No. 2003/0029731 A1).

Ashjaee teaches a method of forming a metal layer on a substrate, comprising the steps of:

(a) positioning a substrate **16** in an electroplating cell **9c** having a porous pad **8** and an electrolyte solution **9a** therein;

(b) contacting at least a portion of the substrate to the porous pad (= the pad **8**

and the wafer surface **22** touch each other) [page 3, ¶ [0039]; and Fig. 4]; and

(c) forming a metal layer on the substrate by biasing the substrate relative to an electrode at a first electrical bias and then biasing the substrate relative to the electrode at a second electrical bias, wherein the first electrical bias deposits metal on the substrate and the second electrical bias removes metal from the substrate (page 1, ¶ [0011]; and page 4, ¶ [0046]).

Ashjaee does not teach varying the magnitude of the second electrical bias relative to the first electrical bias as the metal layer is formed.

However, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Ashjaee by varying the magnitude of the second electrical bias relative to the first electrical bias as the metal layer is formed because Ashjaee teaches that when changing from electroplating to electropolishing, the circuitry used for application and adjustment of voltage, and for inversion of the voltage polarity, is well known and commonly used (page 4, ¶ [0046]). Thus, the magnitude of the second electrical bias relative to the first electrical bias would have been varied based on the difference in the amount of electric potential applied to the electrode which determines when the electrode is used for plating and when the electrode is used for electropolishing, and on the changes in resistance for the deposition of the conductive material and for the

removal of the conductive material.

Furthermore, the magnitude of the second electrical bias relative to the first electrical bias is a result-effective variable and one skilled in the art has the skill to calculate the magnitude that would determine the success of the desired reaction to occur, i.e., plating or polishing, absent evidence to the contrary. MPEP § 2141.03 and § 2144.05(b).

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the

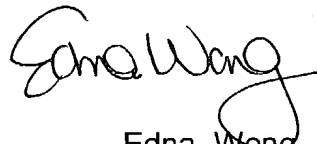


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examiner should be directed to Edna Wong whose telephone number is (571) 272-1349. The examiner can normally be reached on Mon-Fri 7:30 am to 5:00 pm, alt. Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Edna Wong  
Primary Examiner  
Art Unit 1753

EW  
January 30, 2004